

lose a significant portion of their initial weight (30-50%) as tars and gases. While a portion of these products can be utilized as a binder and for process heat, the quantity produced using prior processes is generally larger than can be consumed within the facility and, therefore, must be appropriately disposed of or sold to enhance the economic attractiveness of the process. Due to the high cost of processing these by-products and their aromatic nature, they must often be sold as low quality feedstock materials to refiners at low prices.

The present processes take advantage of the fact that coke is very low in volatile matter (1-2%) and therefore produces nearly no pyrolytic products. This process comprises blending coke fines with coal fines in the proper amount to create just enough pyrolytic products required to perpetuate the process.

The mixture of coal/coke fines [are] is cleaned and blended with tar or other fixed-carbon producing binders. The mix may then be formed into appropriate solid shapes. These shapes are then fed to a pyrolyzer, where the temperature is raised to 800-1100°C to devolatilize the solid objects driving off tars and gases and leaving a strong, high carbon-content coke. The gases and tars are cooled to approximately 300°C, condensing the tars, allowing them to be separated from the fuel-rich gas and collected. The tars are then recycled to be used within the process as a binder while the gases are oxidized to provide heat to the pyrolyzer. Calculations indicate that, with, for example only, a mix of 55% coke fines, 30% bituminous coal fines and 15% binder, the amounts of tars and gases generated are appropriate to operate the process in a closed-loop fashion. Of course these proportions will vary under control of one skilled in the art, depending on feedstock properties. At a briquette pyrolysis temperature of 900°C, typical product yields for the various constituents are shown in TABLE 2, below:

costs for a briquetting plant of this size include raw materials costs and processing costs. Raw materials costs are estimated to be in the range of \$10/ton for waste coal fines and \$20/ton for coke fines. The processing costs for briquetting, which include the price of an additional natural or synthetic binder, are estimated to be around \$18/ton, depending on the type of binder.

An FMC formed coke plant, as stated above, uses multiple fluidized beds for char production and a curing oven and calciner for coke production. The processing and capital costs associated with commercial use of the present technology are expected to be much lower than for prior form coke processes, since the char production step is eliminated. Total costs for coke production from the present process are likely to be in the range of \$50-60/ton, without requiring the sale of by-products. Current metallurgical coke prices are in the range of \$100-120/ton and foundry coke is \$140-160/ton.

For a steel plant producing 6,000 THM/day, at an approximate rate of 500 lbs coke/THM and at an approximate cost of \$100/ton for coke, the replacement value of the coke normally lost would be about \$5.5 million a year. Reduction in the amount purchased, since all the coke is initially used or reclaimed and used, represents another 1% or \$0.55 million. With briquette costs expected to be around \$50-60/ton, a net savings of \$3.3 to \$2.8 million/year is expected.

The characteristics of supplemental coke products and cokes made from alternative coking technologies must fall within the strict standards necessary for its intended use. The most stringent requirements for coke are associated with blast furnace use. Metallurgical coke used in blast furnaces must be (1) a fuel to provide heat to meet the endothermic requirements of chemical reactions and melting of the slag and metal, (2) a producer and regenerator of reducing gases for the reduction of iron oxides, and (3) an agent to provide permeability for gas flow and support for furnace burden. Because of the many requirements placed on metallurgical coke, it must meet